Rigged Hill Windfarm Repowering

Technical Appendix A3.1: Outline Decommissioning/ Construction Environmental Management Plan

Volume 3 – Technical Appendices
July 2019

www.scottishpowerrenewables.com

SCOTTISHPOWER RENEWABLES

REVISION HISTORY (limited to 3 latest revisions)

Revision	Effective Date	Details and Reason for Change	Pages Modified
002	27/11/18	Updated entire document	all

OVERVIEW

Purpose

The purpose of this document is to supplement information within the Environmental Statement (ES), demonstrating the linkages between the ES, site activities, and likely planning conditions associated with any consent. A Construction Environmental Management Plan (DCEMP) sets out the controls and processes that are to be adopted to mitigate environmental impacts throughout a project. DCEMPs are generally iterative and develop throughout the construction programme.

For SPR Windfarm developments, the preparation of a DCEMP is the responsibility of the appointed Principal Contractor (The Principal Contractor is generally the “Infrastructure Contractor” who is responsible for the balance of plant). SPR have certain environmental management standards that require to be considered for inclusion in DCEMPs at our construction sites.

This document outlines, at a high level, SPR’s minimum requirements for DCEMPs and provides guidance on the content. The document is based on SPRs Environmental Management System (EMS) requirements, Industry Best Practice and relevant legislation (at the time of preparation). This document is supported by Appendix A3.1A Water Construction Environmental Plan (WCEMP) which covers water management in more detail. Measures within the WCEMP are considered part of the embedded design of the Development and are referenced throughout Chapter 7: Hydrology, Hydrogeology, Geology, Soils and Peat.

It must be noted that this document sets out SPR minimum requirements for inclusion within a DCEMP and sets out guidance and best practice for adoption at SPR construction sites. The Principal Contractor is likely to have their own management system requirements and DCEMP templates. Therefore the final site DCEMP may vary from what is set out within this document. Site specific sensitivities and requirements of any planning consent, along with updates in legal requirements and construction best practice will also require to be considered in the development of the site DCEMP.

Scope	Onshore Windfarm Sites
Responsibility	N/A
Associated Documents	Environmental Policy
Definitions	List and define all acronyms or technical terminology.
Materials & Equipment	**None**

TABLE OF CONTENT

1. Introduction

Purpose

The purpose of this document is to supplement information within the Environmental Statement (ES), demonstrating the linkages between the ES, site activities, and likely planning conditions associated with any consent. The Decommissioning / Construction Environmental Management Plan (DCEMP) sets out the controls and processes that are to be adopted to mitigate environmental impacts throughout a project. CEMPs are generally iterative and develop throughout the construction programme. For the purposes of the repowering project, this document also considers the impact of the decommissioning processes.

For SPR Windfarm developments, the preparation of a DCEMP is the responsibility of the appointed Principal Contractor (The Principal Contractor is generally the "Infrastructure Contractor" who is responsible for the balance of plant). SPR have certain environmental management standards that require to be considered for inclusion in DCEMPs at our construction sites.

This document outlines, at a high level, SPR's minimum requirements for DCEMPs and provides guidance on the content. The document is based on SPRs Environmental Management System (EMS) requirements, Industry Best Practice and relevant legislation (at the time of preparation). This document has been prepared as an appendix to the Environmental Statement.

It must be noted that this document sets out SPR minimum requirements for inclusion within a DCEMP and sets out guidance and best practice for adoption at SPR construction sites. The Principal Contractor is likely to have their own management system requirements and DCEMP templates. Therefore, the final site DCEMP may vary from what is set out within this document. Site specific sensitivities and requirements of any planning consent, along with updates in legal requirements and construction best practice will also require to be considered in the development of the site DCEMP.

Scope

The scope of this document is the repowering/construction of seven new turbines and associated infrastructure at the existing Rigged Hill Wind Farm and the Decommissioning of the existing turbines and relevant infrastructure.

Responsibilities For Environmental Management on Site

Environmental Management responsibilities for the site require to be documented. This section shall set out the environmental responsibilities on site, including identification of key site staff and their environmental management responsibilities and how this links in with "Client" responsibilities and that of the project team such as site environmental manager and environmental advisor and environmental specialists such as Ecological Clerk of Works and Archaeologist. Interactions with stakeholders such as the Local Authority and Northern Ireland Environment Agency etc should also be covered in this section.

On the majority of construction sites SPR employ a Principal Contractor who is responsible for environmental management on site, including the preparation of onsite environmental documentation.

Associated Documentation

This DCEMP should be read in conjunction with the following documents:

- Rigged Hill Wind Farm Repowering Environmental Statement (ES);
- ES – Water Construction Environmental Management Plan (WDCEMP);
- ES – Outline Peat Management Plan (oPMP);
- ES – Habitat Management Plan (HMP).

2. Site Description

The Site is located within the Causeway Coast and Glens Borough Council (CCGBC) administrative area and is approximately 6 kilometres (km) south-east of Limavady in County Derry/Londonderry. The Site is located on summit of Rigged Hill, 377 metres (m) AOD, which takes the form of a north-south running ridge set between Temain Hill to the south of the Site (376 m AOD) and Boyd's Mountain (329 m AOD). The upper areas of the Site are predominantly moorland cover; the main land use, in conjunction with the Operational Rigged Hill Windfarm, is agricultural grazing. Elevations of the Site range from approximately 110 m AOD in the west of the Site, to 377 m AOD at the summit of Rigged Hill. The ten existing turbines associated with the Operational Rigged Hill Windfarm are located in two rows running roughly in parallel with the ridgeline.

There are a number of small unnamed watercourses and man-made open field drains within the Site, most of which drain in a westerly direction into the Castle River 3 km west of the Site, before discharging into the River Roe north of Limavady. There are no public roads within the Site and the Operational Rigged Hill Windfarm is currently accessed through Cam Forest from the B66, located to the north of the Site.

The construction of the Development will comprise of the following main components:

- Decommissioning of the existing 10 turbines;
- Removal and restoration of the existing substation building and compound;
- Removal and restoration of other redundant infrastructure;
- The erection of 7 three bladed horizontal axis wind turbines of up to 137 m tip height;
- Turbine foundations;
- Construction of approximately 4.82 km of new access tracks;
- Upgrade of approximately 1.75 km of existing access tracks;
- Construction of temporary and permanent hardstanding areas for each turbine to accommodate turbine component laydown areas, crane hardstanding areas and external transformers and/or switchgears;
- Temporary construction compound/laydown areas (some areas may be reinstated temporarily if required for future operational and decommissioning purposes);
- Turning heads and passing places incorporated within the site access infrastructure;
- New road junction with Terrydoo Road;
- Five new water crossings;
- Meteorological Mast;
- Buried underground electrical and communication cables;
- Substation, with roof mounted solar panels, and associated compound, including windfarm and grid connection operating equipment;
- Energy storage units;
- Removal of self-seeded trees in east of the Site;
- Associated ancillary works; and
- Micrositing allowance of 50m deviation (in all directions) from the indicative design footprint.

3. Environmental Management

Sustainable Development should be integrated throughout the decommissioning and construction stages. This can bring benefits from not only an environmental perspective but also economic and social and can cover matters such as site planning, material selection, resource and energy use, recycling and waste minimisation. This section therefore shall set out details of the controls and processes to be adopted to mitigate the environmental impacts on site and any opportunities or initiatives should also be explored at a site level.

Typically, this would cover the following items.

- Surface Water Management
- Oil and Chemical delivery and storage
- Wastewater and Water supply monitoring and control
- Waste and Resource Management
- Traffic and Transport
- Air, Noise & Vibration, Land Management including Archaeology, Flora and Fauna
- Environmental Incident Response
- Method Statements and Risk Assessments

A brief overview of some of the key issues is provided below. However, it must be noted that these are not exhaustive and will be developed for the specific site.

Surface Water Management

This section of the DCEMP shall detail practices related to the protection, control, and movement of surface water.

SPRs Principal Contractor will be required to prepare detailed site surface water management design/ drainage plans for the site. The designs shall detail the surface water management measures to be implemented during the works. The detailed design shall be supported by calculations and methodologies for sizing of the proposed measures, including lagoons, ditches, culverts etc and drawings detailing site characteristics including topography, surface water, groundwater, catchment area, site sensitivities and guidance for implementation. Where appropriate the principles of Sustainable Urban Drainage Schemes shall be applied. Design information will require to cover both the temporary and permanent drainage measures on site.

It should be noted that for projects being constructed in Northern Ireland, a discharge consent is only required where trade or sewerage water would be discharged to any waterway. Nevertheless, the production of a site Pollution Prevention Plan with associated drainage plans which will be managed by the Principal Contractor and shall detail all site specific surface water management measures.

The most significant potential source of contamination to surface waters is suspended solids, however other sources may include a chemical or hydrocarbon spill, vehicle/wheel washings, concrete washings and wastewater.

Definitions related to surface water management include:

- **Surface Water** — Water that collects on the land surface such as lakes, rivers, streams and is related to groundwater.
- **Run-Off** — Water flow that occurs overland from rain, snow melt or other sources which subsequently enters into a drainage system or other surface water systems.
- **Suspended Solids** — refers to small solid particles which remain in suspension in water as a colloid or due to the motion of the water. It is used as one indicator of water quality. Consists of silt, clay, fine particles of organic and inorganic matter, insoluble organic compounds and microscopic organisms

Protocols

As part of the approach to site surface water management the Principal Contractor should check the weather forecast (such as Met Office five day forecast) on a regular basis in order to track any potential heavy rainfall events. The Principal Contractor shall produce, communicate and implement a wet weather and snow melt protocol which shall detail the actions to be taken in programming work in advance and during wet weather and snow melt in regard to work activities. The purpose is to reduce the generation of silty run-off from construction activities on-site and potential for pollution of watercourses.

Surface Water Management Measures Onsite

The best type of system for a construction site will be dependent on a number of factors including the amount of rainfall on-site, the gradient of the site, soil type and land available on-site. The Principal Contractor will decide what surface water management measures are best suited for the site. Some of the techniques available are detailed below;

Cut-off Ditches- can be put in place upslope of excavations, roads and other infrastructure elements or other work areas to collect clean run off before it reaches the disturbed ground and divert it around or away from the work site This greenfield flow can them be discharged over a suitable dispersion area of undisturbed vegetation for example.

Drainage Ditches – can be put in place in order to capture surface water runoff from the roads or other infrastructure elements on-site and divert this to an appropriate discharge point via surface water control and mitigation measures such as those referred to below. The use of such control measures reduces the amount of silt within the runoff and therefore reduces the impact of the discharge into watercourses.

It is important that cut-off ditches and drainage ditches are implemented in advance of the main construction activities and are designed to ensure that, as far as possible, clean water is not contaminated by dirty water.

Silt Fences – are designed in order to effectively filter the water, holding back the silt and allowing the water through, they require to be installed correctly with the lower part of the fence dug into the ground. Silt fences will also require to be cleaned out on a regular basis, particularly after periods of heavy rainfall. Silt fences require to be inspected and maintained on a regular basis in order to ensure that silty water is not running under or round the silt fences

Splash Backs – can be put in place where the roads on-site cross over watercourses and ditches. Generally, silt fence is installed in order to prevent silty runoff from the roads entering directly into watercourses. These require to be inspected and maintained in order to ensure that silty runoff does not enter directly into the surface watercourses below.

Settlement Lagoons – control surface water run-off by slowing the flow of water and allowing the silt particles to drop out of suspension, before the water is discharged. Lagoons must be sized appropriately taking into consideration the anticipated volume and quality of run off they will be receiving. A number of lagoons in series and/or in parallel may be required to provide adequate settlement time. Lagoons require to be maintained e.g. cleaned out on a regular basis, in order to ensure peak performance. A series of lagoons maybe required to provide adequate settlement.

It is important that settlement lagoons are constructed prior to works likely to generate silty run off to ensure that all potential run-off is captured

Flocculants - may also be used to aid settlement of fine particles. These involve a chemical solution that can be used to force very fine particles to clump together and settle out of the water column. The point of treatment shall be constructed in such a way to allow controlled dosing and a documented register shall be kept to record use of chemicals at each treatment location. A settlement area needs to be provided after the point of treatment to give the flocculants a chance to work and the particles to settle out.

The use of Flocculants will require approval from the regulator, and should be reserved for only if issues are encountered with conventional treatment methods, and if very fine sediment particles (e.g. clay) are being encountered. All surface water management measures on-site require to be maintained by the Principal Contractor. It is important that maintenance is undertaken in order to ensure that settlement lagoons and silt fences are de-sludged when required as the retention capacity of the system will be affected by a build-up of sediment.

All mitigation measures implemented on site will require to be visually monitored on a regular basis this may be weekly as a minimum (frequency related to risk, site sensitivity, weather conditions, etc), with inspections of mitigation measures also being carried out after periods of heavy rainfall. Inspections of mitigation measures and any required maintenance will be carried out by the Principal Contractor. A record of any findings from the inspections carried out by the Principal Contractor will require to be recorded including details of any silty water runoff impacting on watercourses or any maintenance required to mitigation measures e.g. such as the cleaning out of silt fences or lagoons.

Oil and Chemical delivery and storage

Oils and chemicals should only be ordered in manageable quantities and stored responsibly i.e. in a bunded area or suitable container/storage area, in accordance with relevant legislation and containers must be labelled with details of contents.

All deliveries of oils and chemicals should be met by a competent member of staff who will direct the driver to the delivery point. Spillage kits must be available at or near the delivery point for emergencies. Depending on the site, there may be a requirement to escort the delivery vehicle (such as for fuel deliveries) onto and through the site.

All fuel tanks should be kept locked when not in use. All oils and chemicals should be returned to the storage area after use. All fuel and oil will be stored in line with the Control of Pollution (Oil Storage) Regulations (Northern Ireland) 2010 (as amended).

Fuel oil shall be delivered to site by road tanker and transferred to mobile bowsers and/or the static tank(s) within a designated fuel transfer area (refuelling area) in the site compound and/or designated refuelling areas on site for mobile bowsers. Any fuel bowsers or static tanks on-site will require to be bunded to 110% capacity

It is a ScottishPower Renewables requirement that storage of static generator(s) and associated fuel tank(s), which are separate with inter-connecting hoses require to be located within a covered impermeable bund – where these will be located on-site for the “duration of the works” e.g. at construction compounds. This follows best practice as set out in PPG 6. Bunds shall be constructed from concrete block work or similar (e.g. a walled containment facility). Prevent rainwater from accumulating in bunds as this compromise the containment. If required, drainage of these areas shall be via an Oil Separator.

Where this arrangement is for a short duration such as 6 months or less e.g. at the construction of a control building, alternative containment options can be considered, subject to site sensitivities and duration e.g. such as containment of inter-connecting hoses using a plant nappy and agreement with ScottishPower Renewables

Where more than one container is stored, the storage bund should be capable of storing at least 110% of the largest container or at least 25% of the total storage capacity, whichever is the greater. Oil absorbent spill response kits should be immediately to hand and be used to mop up any spillage. The following sets out general storage requirements for oils and chemicals;

- All storage containers should be clearly labelled in accordance with Control of Substances Hazardous to Health (COSHH) requirements or appropriate replacement legislation. All containers should be stored in an upright position.

- The Site should maintain a COSHH inventory.
- Storage of oils and chemicals should be controlled (such as segregation) to prevent a reaction between the different types; for example, gas cylinders should be stored separately, as should substances marked flammable.
- When determining storage locations consideration should be made to enable adequate access and egress for plant and manual handling.
- Where external storage is required, locations should be sited at appropriate distances from watercourses, possible routes to watercourses and drains and should consider site sensitivities and the scope of activities being undertaken. Storage areas should be located in areas free from vehicle movements to minimise the risk of collision damage.
- The contractor should also consider the installation of oil interceptors within compound drainage where a significant volume of fuel and oil is stored.

Refuelling

Refuelling activities on-site should be undertaken by a designated and trained member of staff. Refuelling should only be carried out in designated refuelling areas. These areas should be located away from watercourses and drains and should consider site sensitivities and the scope of activities being undertaken. Drip trays should be used and spill kits should be located at all refuelling locations, which will also require to be marked on the site plan.

Used spillage response kit material and waste oil shall be treated as hazardous/ special waste and stored appropriately on-site. All waste will require to be disposed of off-site to a licensed disposal site.

Inspection and Maintenance

Oil and chemical storage areas should be inspected, at least weekly for signs of spillage, leaks and damage. Rainwater, materials and general debris in bunds and drip trays should be removed as part of the maintenance programme.

Disposal of Oils and Chemicals

Details for the disposal of oils and chemicals should be set out in the waste management section of the DCEMP.

Wastewater and Water supply monitoring and control

Wastewater presents a hazard to the environment and can cause contamination of groundwater and pollution of surface waters.

In order to manage wastewater and water supply facilities at construction sites a series of monitoring and maintenance control measures should be put in place.

Wastewater Monitoring and Control

Waste water facilities on a construction site often comprise of septic tanks, cess pits or holding tanks; all of which will require to be emptied by a licensed waste carrier. Frequency for the emptying of wastewater facilities and associated responsibilities will be assigned by the Principal Contractor. The frequency of emptying will depend on the volume of the associated tank and number of personnel occupying the site.

In the case of a septic tank regular sampling will require to be collected from the discharge point to demonstrate compliance to any quantitative limits set in the discharge consent, authorisation or permit issued by the Scottish Environment Protection Agency (SEPA) or Environment Agency/ (EA), Natural Resource Wales and Northern Ireland Environment Agency (NIEA).

The sample will require to be analysed for the parameters specified in the discharge consent, authorisation or permit; if no parameters are specified it is recommended that the sample should be analysed for suspended solids in order to ensure that the discharge is not causing an adverse environmental impact to the surrounding water environment.

Sampling, screening and recording of sample results to ensure compliance with relevant consent or authorisation conditions will be the responsibility of the Principal Contractor.

Quality of the discharge from septic tank facilities on construction sites should be visually checked by the Principal Contractor on a periodic basis as part of their environmental site inspections.

Concrete washout areas should be planned to ensure that they do not cause congestion with site traffic and designed to prevent the escape of run off into the natural environment of the site such as a lined containment system. When washout areas are full and the concrete has hardened it should be broken out and disposed of in an appropriate manner. Washout areas should be clearly identified at specified locations.

Water Supply

Windfarm construction sites rarely have a connection to a mains water supply with drinking water being supplied via drinking water coolers and toilet and kitchen facilities being supplied via rainwater harvesting via holding tanks on the roof of the construction compound or via tankered water.

In some cases, the construction compound can also be supplied by water from an abstraction point, via a borehole water supply for example, or water may require to be abstracted for other site activities such as on-site concrete batching plants.

The Principal Contractor will be responsible for monitoring and recording the location of abstraction activities on-site and associated abstraction rates during the construction phase to demonstrate compliance to any abstraction licences/permits.

Waste and Resource Management

Waste hierarchy

SPR aims to manage waste in accordance with the waste hierarchy by avoiding waste generation and promoting waste minimisation in the first instance. This applies to both our construction and operational sites. Where waste is produced, we will aim to reuse, recycle or recover where practical and economically feasible prior to considering disposal. We support the Circular Economy and encourage contractors to also adopt this approach where practicable when considering the management of materials.

SPR together with our Suppliers and Sub-contractors who generate or dispose of waste as a result of carrying out their agreed activities require to do so in a controlled manner and in line with current legislation.

Types of Waste

Waste produced on site will generally be regarded as ‘controlled’ waste, which comprises household, commercial or industrial waste. Waste produced by construction sites will usually be regarded as commercial waste since it will have been produced from premises used wholly or mainly for trade or business purposes.

Some controlled wastes are often further classified in view of their difficult nature and additional regulatory controls. In general terms and for most practical purposes it is often easiest to consider wastes as either hazardous or non-hazardous.

General waste arising at site such as waste paper, plastics, wood, metal, packaging, small quantities of waste food and food containers and septic tank waste are likely to fall in the non-hazardous category.

Hazardous wastes produced on site will include oils and fuels, oily rags, solvents, chemicals, and electrical equipment. Absorbent materials used for containing/cleaning spills of substances will be classified as hazardous waste e.g. oil absorbent matting. The materials should be bagged, sealed and labelled and

placed in a hazardous waste storage container in the same way, as any other waste contaminated with a hazardous substance must be treated, and disposed of, as hazardous waste.

Storage of Waste

Waste should be deposited and contained within suitable labelled storage facilities until its removal from site by an authorised waste carrier. Waste should be segregated as appropriate for recycling such as paper, cans, plastics, wood, metal, packaging.

Labelling on containers must be durable and permanent. When determining storage locations, consideration should be made to enable adequate access and egress for plant and manual handling.

Transfer of Waste

Only authorised waste carriers should be employed to remove waste from Construction Sites. The Principal Contractor will be responsible to ensure that carriers have the required documentation such as waste carriers’ licence.

A Waste Transfer Note must accompany and be raised before transfer of any non-hazardous waste off site.

All wastes that are classified as special or hazardous waste are subject to the Consignment Note system for transfer.

Copies of the above documentation shall require to be retained on-site in line with applicable legal requirements.

Waste Management Plan (WMP)

SPR construction sites shall require to have a Site Waste Management Plan, which will be the responsibility of the Principal Contractor. The Plan should record the following information, as a minimum:

- The types of waste generated by the site.
- The management approach for each waste type (Reuse, Recycle, Recover, Dispose).
- The storage arrangements for each waste type;
- Details of Waste Management companies to be used to deal with waste from the project
- The site waste monitoring and reporting arrangements.

Traffic and Transport

During the construction phase, there will be traffic movements within the site boundary in addition to associated traffic movements on the local road network such as heavy goods vehicles, turbine deliveries. Measures to address associated impacts should be set out in the DCEMP and may include a traffic management plan.

Air, Noise, Vibration, Land and Flora and Fauna

Emissions to Air

During construction in dry weather there is the potential for a certain amount of dust to be generated. Some of the measures implemented on site may include, but will not be limited to the following:

- Adherence to the speed limit on site in order to reduce the dust generated from transport on site roads;
- Water bowsers - spraying with water to dampen dust down;
- Road sweepers – remove silt from the road surface to reduce the potential for dust on the public road, if required;
- Materials with the potential to produce dust must be stored accordingly to prevent dust generation e.g. materials stored out of the wind and covered; and

- Transport of dust generating material will be covered.

Noise and Vibration

There is the potential for noise and vibrations to be generated during the construction process. Measures will require to be implemented on site to minimise any effects and a programme of monitoring may be required.

Flora and Fauna

Monitoring of flora and fauna should be undertaken as part of the daily/weekly site inspections carried out by the on-site Ecological Clerk of Works (ECoW)[1] or environmental advisor/manager. All details from the inspections should be recorded in the form of a monthly report; the report should be issued to SPR and the Principal Contractor; with findings of the report being discussed at the monthly health, safety and environmental meetings.

Depending on the location of the site Consents/Licenses may also be required in relation to Protected Species and Habitats.

Land Management: Peat

On sites that will involve the excavations of peat, the Principal Contractor shall prepare a Peat Management Plan. The Plan will take consideration of appropriate guidance, good practice and satisfy the requirements of the regulator.

Environmental Incident Response

Responsible construction and the management of health, safety and environmental risks are paramount to the prevention of environmental incidents. The DCEMP will include an Emergency Environmental Response Procedure, including a response flow chart.

As part of the environmental management controls on Site it is a SPR requirement that the Principal Contractor shall have in place a dedicated “environmental team”. The purpose of this team is to carry out environmental management works on site such as surface water management and to respond to environmental incidents, such as spill response etc.

EERP Flow Chart

Typical contents for an emergency environmental spill response (EERP) flow chart are set out below.

- Assess safety
- Stop Spillage / Leakage at Source
- Contain Spill / Leak
- Notify
- Clean Up (including disposal contaminated material)
- Monitor

Spill Kits

It is an SPR requirement for spill kits to be provided in/with the following on all of SPR construction sites;

- in all heavy plant and equipment, 4x4 and commercial vehicles;
- with all refuelling bowsers;
- with all static fuel tanks; and
- during all refuelling operations, associated transportation and storage

[1] Note The requirement to have an Ecological Clerk of Works will depend on the site sensitivities and planning condition requirements

These kits are used as a first response or for the containment and clean-up of small spills.

In addition, spill kits should be strategically located at sensitivities areas on site or where activities are being conducted that have the potential for a spill placing booms across sensitive watercourses downstream of work areas should also be considered. A supply of spill kits should be held on site and stocks constantly replenished. Contents of the spill kits will be determined by the Principal Contractor in line with best practice.

As part of the EERP a specialist spill response contractor will require to be identified for the site to deal with any major environmental incidents.

Method Statements and Risk Assessments

It is the responsibility of the Principal Contractor to have in place method statements and risk assessments for works being carried out on-site. Where relevant, the method statement should cross reference applicable environmental risk assessments. The risk assessments should identify environmental hazards and outline subsequent control measures.

The following environmental risks are examples which could be identified on a construction site;

- Discharges to water (including accidental spillage);
- Releases to atmosphere (including dust);
- Discharges to land (including accidental spillage);
- Waste management (duty of care compliance); and
- Impact on ecological systems.

Control measures should be developed, implemented and monitored to ensure that any impact on the environment is minimised.

All persons involved in the work activities considered 'key' on a construction site should be given a method statement briefing, in the form of a tool box talk, delivered by the Principal Contractor. This should outline the risks involved and the control measures that personnel are expected to comply with. It is general practice that individuals require to sign a method statement briefing record sheet acknowledging receipt of the information.

Decommissioning Environmental Considerations

Waste Management.

The decommissioning of the turbines will be undertaken in line with the proposed methods as detailed in Section 3 and in line with best practice and the Site Waste Management Plan (WMP)/waste hierarchy.

Where possible, concrete broken out from existing turbine foundations and hardstanding areas will be re-used on site to infill excavations following infrastructure removal (e.g. transformer bases). Where this is not possible, materials will be assessed for potential reuse off-site or recycling.

Turbine components will either be re-used (sold on) or recycled off-site.

Should landfilling of turbine components, concrete, stone or other materials generated during the decommissioning be considered, it will be undertaken in accordance with current Waste Regulations by the appointed Principal Contractor. This would be a last resort.

The Principal Contractor will be required to develop and update a Site Waste Management Plan (SWMP) for the duration of the decommissioning works. The plan will detail waste types and disposal routes / final destinations in accordance with current regulations and guidance.

Ground Disturbance, Material Excavation and Reinstatement.

All plant and machinery moved around site using the existing infrastructure e.g. tracks, hardstanding etc and will not track across adjacent grassland / habitats unless agreed beforehand and if this is essential in order to progress the decommissioning works. No short cuts across site are permitted).

The reinstatement of any areas disturbed during the decommissioning works will be undertaken by the Principal Contractor. The Principal Contractor will record excavated volumes and storage areas, and volumes and type of material utilised for reinstatement of relevant areas. This information will be updated for the duration of the decommissioning works and if necessary, will feed into the SWMP.

Reinstatement will be completed using site-won turfs wherever possible without compromising or damaging established / existing habitats. Where insufficient turfs are available, seed mixes may be applied. The seed mix and method of application will be agreed with a suitably qualified ecologist to ensure that the reinstated habitats are compatible with those existing and surrounding the reinstated areas at the time of decommissioning.

All stockpiled materials will be stored in designated areas and isolated from any surface drains and a minimum of 50 metres away from surface waters. Aggregate or fine materials storage will be enclosed and screened/sheeted. Details of peat and soils stockpiling and management is included in the oPMP.

Topsoil and vegetation must be stored separately from subsoil and shall be retained and reinstated on all areas of stripped ground as soon as possible to prevent erosion and leaching/loss of nutrients. Turfs shall be reinstated with the vegetated side facing upwards, in order to speed up the re-generation process, minimise the need for re-seeding, and help maintain the original species mix.

Ecological Protection

As noted under the section above, ground disturbance out with the existing infrastructure footprint will be avoided, and if occurring, be kept to an absolute minimum. Access routes and disturbance areas will be identified prior to decommissioning works commencing. Pre-start ecological surveys will be undertaken to ensure that works will not impact on any protected species.

Should any decommissioning/construction works be undertaken within the breeding bird season (March to July inclusively), SPR will appoint an ecologist to provide advice and undertake bird mitigation and monitoring during the initial decommissioning and construction works. The ecologist will be appointed prior to the breeding bird season commencing and they will liaise with NIEA with regard to possible bird deterrent measures, mitigation measures timing etc. Any advice and recommendations for mitigation measures provided by the ecologist, in consultation with NIEA, will be taken into account during the planning and execution of the works.

General Pollution Prevention Measures

The following points (not exhaustive) indicate general pollution prevention measures in accordance with those highlighted within the guidelines referenced in this document.

Any material or substance which could cause pollution, including fuels/oils, wet cement, raw concrete or silty water will be prevented from entering groundwater, surface water drains or surface waters by the appropriate use of and appropriate placement of (temporary) e.g. cut-off drains and silt traps. Any sign of failing water treatment measures or sight of silted or contaminated water entering any surface water on site will be reported immediately.

All refuelling will be carried out in a designated area over an impermeable surface (hardstanding / protective layer / trays) at least 50 metres from surface waters / surface water drains. Refuelling and transfer of fuels will only be carried out under the supervision of an appropriately.

4. Decommissioning Plan

Background

The first phase of the Development will comprise the decommissioning and removal of the existing turbines, external transformers and wind monitoring masts from the site. It is anticipated that the turbines and external transformers will be carefully dismantled and transported offsite, possibly for resale in the second-hand market, estimated to commence in 2023. It is expected that the construction phase of the Development will run in parallel with the decommissioning of the Operational Rigged Hill Windfarm and take approximately 8 months in total. This period is somewhat weather dependent and could be affected by onsite conditions.

The dismantling of the Operational Rigged Hill Windfarm is expected to take approximately two months following an initial period of four weeks during which a temporary decommissioning / construction compound will be constructed and existing tracks and crane hardstandings will be cleared of vegetation and upgraded for use by decommissioning vehicles as required.

The decommissioning of the wind farm infrastructure is not expected to pose significant risks to the environment (based on the ES), nevertheless risks need to be addressed in order to ensure that no or insignificant impact on the environment occurs. It is expected that the environmental protection and mitigation measures specified within the DCEMP and the HMP will apply also apply to decommissioning. In this regard, all requirements contained within the ES and DCEMP with regards to mitigation and protection for ecological receptors, waste management, surface water management, peat disturbance and prevention of pollution will also apply to decommissioning works.

The decommissioning of turbine components will be undertaken in line with best practice and the waste hierarchy.

Decommissioning Details

Following initial track construction and upgrade, cranes will be used to split the turbines into suitable sections, which will then be transported from the Site by heavy goods vehicles (HGVs) for resale. Following removal of the blades, power cables will be disconnected and lowered with control cables left in place, before the tower sections are lowered.

Where possible, concrete broken out from existing turbine foundations and hardstanding areas will be re-used on site. Where this is not possible, materials will be assessed for potential reuse off-site or recycling.

Turbine components will be either reused (sold on) or recycled off-site.

Landfilling of turbine components or other materials generated during the decommissioning will be a last resort and will be undertaken in accordance with current Waste Regulations by the appointed Principal Contractor. All wastes will be dealt with in accordance with a Site Waste Management Plan (SWMP) developed prior to commencement of decommissioning works and maintained as a live

Buildings will be demolished and all interior and exterior components taken off site for reuse or recycling wherever possible.

In locations where the areas of the turbine and transformer bases will not form part of the new crane hardstanding and laydown areas, they will be cut to 1 m below the surface and backfilled with suitable topsoil, generated from the construction activities elsewhere in the Site. Areas of hardstanding and access track which are being reused will be retained, whilst unaffected areas of hardstanding and access track

that have already naturally regenerated will either be left in situ, or removed and reinstated, with materials reused in the construction activities elsewhere on the Site and in accordance with the Draft HMP.

Redundant tracks will be broken out and stone removed or reused on site if a suitable use can be identified. Reinstatement of tracks and turbine foundations and hardstandings will be undertaken by use of either:

- soil material retained on site during the original construction; or
- imported soil and topsoil.

The reinstatement of any areas disturbed during the decommissioning works will be undertaken by the Contractor. The Contractor will be required to record excavated volumes and storage areas, and volumes and type of material utilised for reinstatement and relevant areas.

Should the import of soils or stone be required, then such materials will be accompanied by either a Declaration of Analysis, written confirmation that material was produced under a quality control procedure in accordance with the WRAP Quality Protocol, or other applicable procedure in place at the time of the decommissioning works.

Seeding may be required if suitable vegetation turfs are not available. Seed mixes will be selected to be compatible with existing habitats at the time of decommissioning.

5. Monitoring including Site inspections

Monitoring

A programme of monitoring shall require to be set up for the site, this should be documented in the DCEMP and include the following items, where relevant;

Surveys: Pre-construction and ongoing ecological surveys such as surveys for European Protected Species, bird surveys, protected habitats etc as required.

Site Inspections: The Principal Contractor, or appointed delegate will require to undertake site inspections; on at least a weekly basis (dependant on site activities). These site inspections will require to include an environmental component which will cover the SPR requirements set out on UKEN-IGE-SPR0009 Guidance for Construction Sites Environmental Inspections and as a minimum cover waste management; surface water management; management of hazardous materials, water and wastewater management; emergency response, incidents and complaints, nuisance; and other site-specific issues. Weekly inspections will be complimented by a combination of daily/monthly inspections, dependant on the site-specific requirements.

SPR also carry out periodic site inspections to assess the performance of the various contractors on site. This is recorded on the form UKEN-FGE-SPR0027 Construction Environmental Site Inspection Form which covers the SPR requirements set out above.

The Principal Contractor is responsible for ensuring the close out of any actions identified during the inspections. Records of the inspections carried out are to be retained onsite by the Principal Contractor; any remedial actions required are also recorded.

Environmental Audits: internal (Principal Contractor) and external (via Client). The SPR EMS and associated audit programme includes the requirement to audit SPR construction sites on a periodic basis. This is in addition to the site inspections. An audit checklist is used to ensure that a standard approach is applied across all of our construction sites. All audits are carried out by trained personnel within the SPR environmental team (or delegated specialists). All actions raised from the audit are logged within the EMS; progress tracked and a closing date assigned when the action is complete.

Physical monitoring: A programme of physical monitoring may be established such as water quality, dust, noise, vibration, and energy and resource usage.

6. Legal Compliance

Planning Conditions

SPR sites are constructed under specific consents and licenses issued by Government bodies such as the Planning Inspectorate, Local Authority, Energy Consents Unit and the Regulators such as SEPA, the Environment Agency, Natural Resource Wales, Northern Ireland Environment Agency, Environmental Protection Agency (Ireland) . Specific limits for emissions to air, land and water and working practices (such as seasonal exclusions) are contained within these consents/licenses and may not be breached at any time.

The Principal Contractor will be required to ensure that all relevant planning conditions for the site are complied with.

In addition, the SPR project manager will be responsible for maintaining an up-to-date register of the planning conditions for the site that specifically relate to the construction phase of the project. Planning conditions will be reviewed by the SPR project manager on a periodic basis to ensure that all of the planning conditions are being complied with and progress against each planning condition will be logged in the register. A copy of the planning conditions will require to be held on-site.

Legal Register

The Principal Contractor will be required to ensure that all relevant environmental legislation and best practice are complied with on site.

In addition, it is SPR policy to minimise the impact of its construction activities on the environment by complying with all current environmental legislation and best practice. In order to ensure that SPR are aware of the requirements of current environmental legislation a Legal and Compliance Register is kept as part of the SPR EMS.

All contractors on-site including the Principal Contractor and the turbine contractor are required to comply with current (and future) environmental legislation, regulations, best practice, and standards applicable to the activities in which they are engaged and other environmental requirements decided upon by SPR. This includes maintaining sufficient records of environmental information and audits both to show compliance with legal requirements and to demonstrate continual improvement where appropriate.

The Principal Contractor will be responsible for applying and obtaining any related consents/licenses to their activities such as septic tank consents, water abstraction licenses, activities associated with water crossings, environmental protected species licenses and other discharge consents or environmental permits.

SPR will assess compliance to relevant environmental legislation as part of the SPR construction site environmental audits and inspections.

7. Training including Site Induction

Various mechanisms are employed at construction sites to communicate environmental management requirements. Key mechanisms are set out below.

Site Inductions

All SPR construction sites require to have a site induction that includes an environmental component. Designated on site personnel from the Principal Contractors project team will be responsible for preparing

and delivering the site induction and maintaining documented attendee records. SPR have guidance on the environmental management contents of site inductions that includes the following items:

- Permits/licences;
- Waste;
- Water and Wastewater;
- Fuel, Oil and Chemical Management;
- Spillage; and
- Environmental Incident Reporting and Environmental Emergency Response Arrangements.

Tool Box Talks (TBT)

TBT are an effective method for the dissemination of information relating to work activities. Environmental TBTs will require to be delivered by the Principal Contractor to on-site personnel on an as required basis. When a TBT has been delivered it is the responsibility of the Principal Contractor to ensure that all personnel attending the TBT have signed a TBT attendance sheet. Topics for environmental TBT may include;

- Waste Management
- Delivery and Storage of Oils and Chemicals
- Waste Water and Water Supply Monitoring
- Surface Water Management
- Emergency Response
- Ecological Sensitivities
- Spill response training

Environmental Notice board

It is an SPR requirement that all our constructions sites have an environmental notice board. The notice board will be used to display copies of relevant environmental management information, including but not limited to the following;

- SPR Environmental Policy
- SPR Environmental Behaviours
- Relevant SPR Environmental Bulletins and Alerts
- Site Plan showing ecologically sensitive areas or management areas
- Emergency Response Contact Details
- Emergency Response Flowchart

8. Reference material

Key reference material in this section of the DCEMP should include the following.

- Site Planning Conditions
- Legal Register
- Consents/Licences/Permits

- Best Practice Guidance/Industry Standards such as Pollution Prevention Guidelines and the updated Guidance for Pollution Prevention (GPPs). Copies of these documents are available through the NetRegs web site.

9. Reporting

Environmental Incidents

The Principal Contractor will be required to prepare a site specific environmental emergency incident response plan. The plan will require to include how to report and deal with an environmental incident including the measures available to contain/clean up an incident (e.g. spill kits).

It is the responsibility of the Principal Contractor to ensure that all staff including any subcontractors are trained in the environmental emergency response plan so that they are prepared to respond to an incident promptly and effectively on-site. Where appropriate, SPR encourage a test of the environmental emergency response plan to be carried out on-site by the Principal Contractor.

The Principal Contractor will be required to report environmental incidents to the SPR project team. Details of the incident report require to be logged in the SPR reporting system by the relevant SPR project team member.

Public Complaints

The Principal Contractor will require to have in place a procedure for recording and responding to public complaints. The Principal Contractor will be required to report public complaints to the SPR project team. Details of the complaint are required to be logged in the SPR reporting system by the relevant SPR project team member.

Meetings

Environmental meetings and debriefs will require to be held on-site. This includes a standard monthly health, safety and environment meeting that is required to be held on all SPR construction sites. The meeting will require to be chaired by a member of the SPR project team and attendees generally include the Principal Contractor, turbine supplier, key sub-contractors and environmental specialists such as Ecological Clerk of Works.

Where deemed appropriate and on sites where an Ecological Clerk of Works is present, weekly ECoW meetings may be held between the ECoW and the Principal Contractor and any other appropriate parties. The purpose of these meetings is to discuss ongoing issues relating to the ECoWs remit, that have been raised through the ECoW reports and to produce an action list to help prioritise the close out of the actions.

Community Liaison

Depending on the site location, a public/community relations plan may be developed for the site by the Principal Contractor. The purpose of the plan is to set out the approach to community liaison for the duration of the Project. SPR would also contribute to the plan.

10. Contractor Management

The Site DCEMP should set out how the Principal Contractor manages their subcontractor's onsite. This may range from the selection and assessment processes to the assessment of performance on site.

In regards to SPR, SPR appoint third parties to construct our portfolio of onshore windfarms such as the Principal Contractor and turbine supplier.

SPR have a preference for our construction sites to be registered by our Principal Contractors under the Considerate Contractors Scheme. Sites and companies that register with the scheme are monitored

against a Code of Considerate Practice that focuses on three main areas of concern: the general public, the workforce and the environment.

Rigged Hill Windfarm Repowering

Technical Appendix A3.2: Draft Habitat Management Plan

Volume 3 – Technical Appendix
July 2019

www.scottishpowerrenewables.com

SCOTTISHPOWER RENEWABLES

Rigged Hill Windfarm

Habitat Management Plan

July 2019

Version 3.0

CONTENTS

List of Figures and Maps

1 Introduction

The overall purpose of the Rigged Hill Repowering Habitat Management Plan ("the HMP") is to implement positive land management for the benefit of landscape and nature conservation which will mitigate any adverse impacts that the Windfarm may have had. In addition to purely mitigating against any adverse impacts, ScottishPower Renewables is also committed to enhancing the nature conservation and landscape value of the Windfarm site. The HMP defines the Aims and Objectives of the land management that will be implemented on site to achieve this overall purpose.

1.1 Background

ScottishPower Renewables' (SPR) proposal for the decommissioning and repowering of the current Rigged Hill Windfarm is about to be submitted as a planning application, and this document will be submitted in support of the application. The proposal will advocate the removal of the existing turbines and replacing them with 7 larger turbines. Where possible the existing infrastructure will be reused, although as part of the repowering development new access tracks will need to be constructed. The associated mitigation and habitat management for the repowering development (including the new access tracks, and main access track) is included within this document.

2 Land Ownership

Land within the site boundary is owned by multiple individuals and has been leased to SPR. The Lease Agreements include provision to enable SPR to implement management works on the surrounding habitat.

3 Site Location and HMP area

The site is located 8km east of Limavady, Northern Ireland. The Habitat Management Area ("the HMA") lies within the development boundary and encompasses a total area of 76.04ha. This incorporates 43.44ha of peatland habitat, which is considered adequate to compensate for the 1.53ha of bog habitat predicted to be lost as part of the project (Rigged Hill Windfarm Repowering Environmental Statement); an 8.67ha management area to compensate for the c. 5.6ha footprint of the main access track; and a 23.94ha management area to which includes a suite of measures to improve the habitat for a wide range of bird species, but particularly snipe, hen harrier, kestrel, skylark and meadow pipit. The breakdown of the areas is shown in Table 1.

Name	Area (ha)
Unit A	11.98
Unit B	6.50
Unit C	16.66
Unit D	7.86
Unit E	0.44
Unit F	8.67
Unit G	23.94
Total	**76.04**

Table 1: HMA breakdown

4 Habitat Condition

4.1 Overview

Prior to developing the HMP SPR commissioned a Phase 1 habitat survey to classify habitat type across the site. Where potentially sensitive habitats such as bog or heath were identified, further surveys were carried out to inform condition and provide more detailed information on peat depth, vegetation composition and the underlying site hydrology.

4.1.1 Peatland habitat status

Although most of the site is on peat >50cm, historical land management including peat cutting, livestock grazing and drainage has had a negative impact on bog condition. The deepest peat is located on the eastern hill plateau (circa. 3m maximum depth), although there are a number of shallower areas, particularly to the south of the site. Peat depth typically decreases with increased slope and reduced elevation towards the west of the site, as the habitat transitions from a degraded bog to heathland and eventually to grassland. Monitoring of dipwells indicated that the bog water table across the site is lower than would normally be found on an intact bog (see Appendix A for further details).

Unit A has extensive evidence of historic peat cutting along with a drainage network at 10m spacing covering the entire area (Photo 1). Although *Sphagnum* mosses persist in the depressions the drains remain active which act to lower the water table. Peat depth is relatively shallow (approximately 30cm), but there is potential for positive management work to restore the habitat.

An old peat bank separates Unit A and Unit B, with the peat in Unit B apparently uncut and remains over 1m depth (Photo 2).

Photos 1 & 2: Drains in Unit A (left) and old peat bank separating Units A & B (right)

The 10m spacing drainage pattern continues across Unit B, and there is evidence of dryer hydrological conditions with *Calluna vulgaris* and non-bog grasses prevalent whereas *Sphagnum* mosses are restricted to the drains. Regenerating conifers are widespread throughout Unit B, and there is evidence that attempts have previously been made to remove the trees, with residue and stumps

visible throughout the area (Photo 3). The conifers are variable in height and density with some reaching over 4m.

Photo 3: Regenerating conifers, old stumps and tree residue on Unit B

Unit C is dominated by *Calluna vulgaris* and also has a high cover of grasses and other dwarf shrubs such as *Vaccinium myrtilus*, species that typically suggest dry conditions. There is no evidence of widespread historical peat cutting or regular drainage in the area which would give rise to the poor hydrology. The area is extensively hummocked with the true peat surface >50cm from the top of the basal layer and very tall dwarf shrub stature.

Regenerating conifers (likely seeded from the adjacent forestry) are found across the area in variable height and density albeit sparser than in Unit B, with some > 4m tall (Photo 4). There is evidence of localised peat cutting along the road edges and a small number of active drains (Map 2).

Photo 4: High *Calluna vulgaris* cover and tall stature, along with sparse regenerating conifers on Unit C

Unit D has been extensively cut historically and is dominated by old peat banks. Dryer hydrological conditions and the adjacent forestry have resulted in numerous regenerating conifers establishing throughout the area.

Unit E comprises the two turbines on peat >1m that are to be decommissioned and restored as part of the repowering development. The existing Turbine 9 is bounded by Unit B and existing Turbine 8 is bounded by Unit C, so the intention for these locations is to reinstate them to create a continuous area of blanket bog across these Units.

4.1.2 Unit F status

The main access track for Rigged Hill windfarm repowering will have a total footprint of c. 5.6ha; including unavoidable impacts on 0.5ha wet heath, 0.35ha acid flush/fen and 300m of hedgerow. Unit F covers an area of 8.67ha and is located in the south of the site, running upslope adjacent to the proposed main access track. There are drainage channels and grazing currently within the area, but grazing appears to be at an appropriate level with no evidence of under or over-grazing.

4.1.3 Unit G status

Unit G is located approximately 1-2km south west of the proposed development turbines and is approximately 23.94ha in size. There are some drainage channels cut in the west of the area, and the land is used for grazing, predominantly by sheep but also cattle.

5 Aims and Objectives

5.1 Delivery Process

The delivery of an HMP is based on achieving the various Aims, which are assessed by measuring the extent to which clearly defined Objectives and their associated condition indicators have been met. The definition of each Objective is therefore a key requirement for an HMP to allow progress to be assessed in a quantified, objective way which has clear implications for whether the overall Aims are likely to be met and any management measures which need to be put in place or amended.

A summary of the stages is shown in Figure 1 which has been applied to each Objective within this HMP. For Objectives where the required management is not obvious, or the processes not well enough understood to allow them to be defined in detail, a programme of trials is advocated to allow the methods, costs, rates and effects of management measures to be assessed before being implemented more widely.

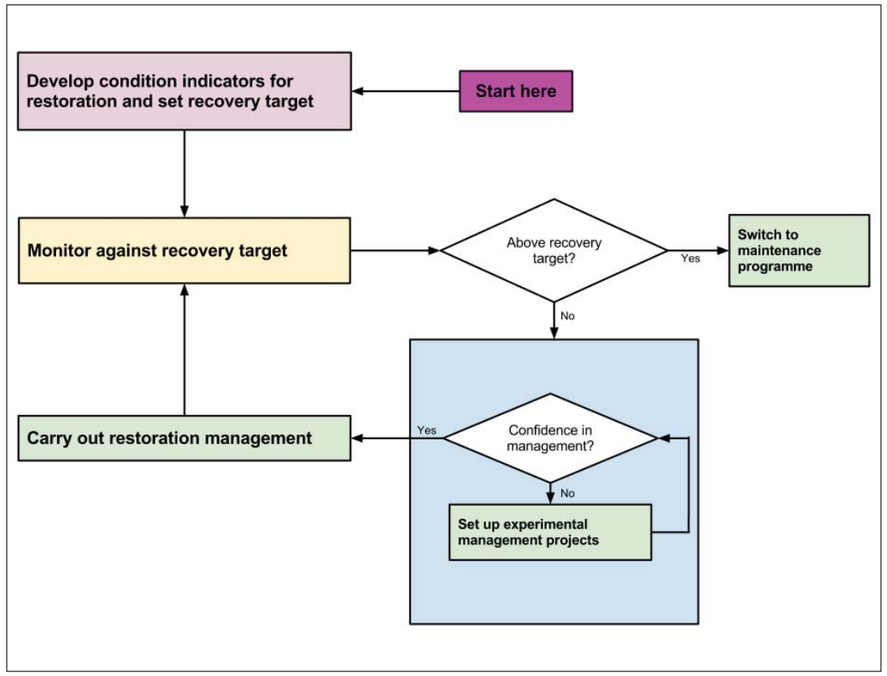


Figure 1: Process for monitoring and management to achieve habitat restoration, redrawn from Hurford and Schneider (2007).

5.2 Quantifying restoration outcomes

Some objectives are considered to be more fundamental than others to achieve in order for habitats to be restored, and have therefore been weighted accordingly (see individual objectives within each Aim for the weighting). This allows an overall weighted average score for the entire site to be

produced out of 100 and compared against with Table 2 below, with 100 demonstrating each objective is met at every sample location. This method allows an overall assessment of restoration progress to be made.

Condition Class	Weighted Average Score
Very poor	< 60.0
Poor	60.01-70.0
Acceptable	70.01-80.0
Good	80.01-90.0
Excellent	90.01-100

Table 2: Scoring system for HMP targets

Table 3 shows the breakdown of each individual objective along with the weighting which is based on the relative importance for bog functioning. The highest weighting is given to bog water table as good hydrology is critical to the function of a healthy bog habitat. Higher weighting is also given to the *Sphagnum* moss objectives as these are the constants of blanket bog habitat and also indicate the basic hydrology is intact.

Aim	Group	Objective	Short Description	Weighting
Aim 1: Underlying Conditions	Bog Water Table	1.1	WT in drought: <20cm	20%
		1.2	WT in drought: <10cm	15%
		1.3	WT in drought: 0cm	5%
	Tree Regeneration	1.4	Trees should be absent	5%
		1.5	Trees should be <1m if present	5%
Aim 2: Conservation Status	Sphagnum & Peat	2.1	Sph. present on plots	10%
		2.2	Thick sph. present on plots	5%
		2.3	Sph. cover >30% on plots	10%
		2.4	Sph. trampling absent on plots	2.5%
		2.5	Bare peat cover <1% on plots	5%
	Higher Plants	2.6	Eri. present on plots	5%
		2.7	Cal. present on plots	5%
		2.8	Cal. >20cm & <20% browsed	2.5%
		2.9	True grass cover <5% on plots	2.5%
		2.10	Key plant cover <75%	2.5%

Table 3: Weighted score given to each objective

The score for a treated area is therefore calculated as follows:

Weighted Average Score = Sum (% Samples which meet Obj. 1.1 * 0.25, % Samples which meet Obj. 1.2 * 0.15..., % Samples which meet Obj. 2.10 * 0.025)

Aims and Objectives are described for the areas of modified blanket bog below. The management measures for each area are described in Section 6, and a description of the monitoring is included in Section 7.

Aim 1: Restore conditions for modified blanket bog habitat

Definition and Distribution
Units A, B, C, D and E have been identified as supporting modified bog habitat which would benefit from positive management activities (Map 2). The area covers 43.44ha and is situated within the turbine envelope.

Background
The condition of the bog habitat across the site is generally poor as a result of historical management. In order to create the underlying conditions required for the establishment of typical bog species, works will need to be carried out to reverse these negative activities and prevent further degradation.

Condition Requirements
The conditions required for blanket bog within these areas are defined as follows:

- Water table depth must be close to the surface, including the drought period April - July
- Regenerating trees must be absent

Based on these requirements a set of Objectives have been defined which will allow progress to be monitored.

Objectives
A number of indicators have been used to formulate Objectives which reflect different aspects of blanket mire quality over time. These will be compared against suitable reference areas where possible to allow the quality of the restored blanket mire to be assessed in context. An Objective is considered to be met when at least 70% of sample plots meet the criteria.

	Objective	Description	Weighting
Bog water table	1.1	The bog water table should be no deeper than 20cm from the surface of the main peat mass on each sampled plot when assessed in summer 'drought conditions' (defined as the time at which water table levels on site are considered to in the lowest 10% of their measured range, and rainfall has been negligible for at least 3 weeks; surveys undertaken any time between 1st April and 31st August).	20%
	1.2	The bog water table should be no deeper than 10cm below the surface of the main peat mass on each sampled plot when assessed in summer 'drought conditions'.	15%
	1.3	The bog water table should be at or above the surface of the main peat mass on each sampled plot when assessed in summer 'drought conditions'.	5%
Tree regeneration	1.4	Conifer trees, broadleaf trees and exotic shrubs (e.g. Rhododendron) should be absent from each sampled plot.	5%
	1.5	Conifer trees, broadleaf trees and exotic shrubs (e.g. Rhododendron) should be < 1m in height if present.	5%

Aim 2: Improve quality of modified blanket bog habitat

Definition and Distribution
Units A, B, C, D and E have been identified as supporting modified bog habitat which would benefit from positive management activities (Map 2). The area covers 43.44ha and is situated within the turbine envelope.

Background
The long-term aspiration (>5 years) is to restore the blanket bog habitat to a high quality. However, the precise vegetation assemblage which would be expected is difficult to define and variation is expected. The response of certain indicators of blanket bog quality will be monitored as a long-term trend which will ultimately help to gauge success by making comparisons with other reference sites.

Objectives
A number of indicators have been used to formulate Objectives which reflect different aspects of blanket bog quality over time. These will be compared against suitable reference areas where possible to allow the quality of the restored blanket bog to be assessed in context. An Objective is considered to be met when at least 70% of sample plots meet the criteria.

	Objective	Description	Weighting
Sphagnum and peat	2.1	At least one species of Sphagnum should be present (open range land: predicted community M17, 18 or 19) on each sampled plot.	10%
	2.2	*Sphagnum papillosum* or *S. magellanicum* should be present (open range land where expected type is M17 & 18) on each sampled plot.	5%
	2.3	Sphagnum spp. should account for at least 30% of basal cover on each sampled plot.	10%
	2.4	Visible trampling or uprooting impacts of large grazing mammals on Sphagnum hummocks (or lawns) should be absent on each sampled plot.	2.5%
	2.5	Bare peat should comprise <1% of 'basal' cover on each sampled plot, in situations where it is arising due to trampling effects or disturbance by machinery (where sites are naturally eroding this target can be modified to suit).	5%
Higher plants	2.6	*Eriophorum* spp. should be present on each sampled plot.	*5%*
	2.7	*Calluna vulgaris* should be present on each sampled plot.	5%
	2.8	*Calluna vulgaris* of at least 20cm average canopy height and with < 20% leading shoots browsed by deer/sheep on average should be present on each sampled plot.	2.5%
	2.9	'True grasses' foliar cover should be less than 5% on each sampled plot.	2.5%
	2.10	The combined cover of *Calluna vulgaris*, *Eriophorum* spp. and *Tricophorum cespitosum* should account for no more than 75% of foliar cover on each sampled plot.	2.5%

6 Habitat Management Measures

The management approaches undertaken by SPR reflect the different requirements of the variable site conditions. Management units are split according to treatment and underlying habitat.

6.1 Management units

Management units have been defined according to areas which require different types of active management, as shown in the table below.

Unit	Habitat	Size
A	Cut / drained bog	11.98
B	Drained bog, regenerating conifers	6.50
C	Dry, hummocked degraded bog	16.66
D	Cut bog, regenerating conifers	7.86
E	Infrastructure to bog	0.44
F	Degraded heath/ flush habitat	8.67
G	Ornithological improvement measures	23.94
	Total area	**76.04ha**

6.2 Units A and B: Drain damming

There are a number of drains across the site which would benefit from being dammed in order to prevent further damage to the hydrological regime. Approximately 14,730m of these are located in Units A and B, with an approximate size of 70cm wide x 50cm deep. SPR has developed a technique to successfully restore drained blanket bog, termed “wave damming” which has proven successful on a number of similar sites in Scotland (Photos 5 & 6). The method rapidly creates dams within existing drains to prevent water flow, which helps stabilize the hydrology and support bog forming species such as *Sphagnum* mosses. A further description of this method is provided in Appendix B. Monitoring had shown that in the absence of treatment, the drains remained active and continued to degrade the surrounding habitat.

Photos 5 & 6: Area of wave damming at Black Law windfarm immediately following treatment (left) and two years post treatment (right)

There are approximately 1288m of drains across the remainder of the site that would benefit from some form of remediation work. These drains are larger in size (approximately 120cm wide x 100cm deep) and will require a combination of interventions including re-profiling, ditch infilling and dam creation. SPR have previously dealt with large drains on a number of sites and would adapt treatment to each drain based on its individual properties. Photo 7 shows one of the large drains within Unit 7 which will be treated using a larger variation of the wave damming technique in combination with infilling using the additional nearby forestry material. In cases where the trains are too large for treatment by wave dams, a combination of plastic piling or conventional peat dams will be used to block and stabilise the drains (Photos 8 & 9).

Photo 7: Large drain within Unit C


Photos 8 & 9: Plastic piling (left) and conventional peat dam mid construction (right)

6.3 Unit B: Ground smoothing/ wave damming combination treatment

Unit B contains a considerable amount of conifer regeneration (comprising establishing trees, brash and old stumps) in addition to extensive drainage (Photo 10). SPR propose to treat Unit B using a combination of wave damming and a technique called ground-smoothing[1]. Ground-smoothing was developed for use on deforested peatland and involves an excavator flipping old forestry stumps into the adjacent furrows (Photo 11), leaving behind a flattened surface where the bog water table is in closer contact with the surface, creating the conditions required to support key bog species such as *Sphagnum* mosses (Photos 12 & 13).


Photos 10 & 11: Unit B at Rigged Hill (left) and excavator flipping a stump (right)

[1] Publication of this technique is part of the IUCN Commission of Inquiry on Peatlands as part of a new chapter "Peatlands and Forestry" due to be published Q2 2019: http://www.iucn-uk-peatlandprogramme.org/commission-inquiry/call-experts/forestry


Photos 12 & 13: Area of ground-smoothing immediately post treatment (left) and +3 years (right)

6.4 Unit C: Tracking

SPR propose to use cross-tracking on Unit C which is dominated by large non-*Sphagnum* moss hummocks and *Calluna vulgaris*. This will involve using a low ground pressure excavator to track across the area, flattening underlying hummocks and checking the growth of the heather. This will have the effect of compressing the surface, allowing the water table to be in closer contact with the main peat mass, reducing the dominance of heather and promoting the establishment of typical bog species such as *Sphagnum* mosses.

6.5 Units B, C and D: Clearance of regenerating conifers

There are two proposed methods for dealing with regenerating conifers across the site. In areas where additional ground-treatment works are required the conifers can be dealt with by excavators concurrently. The operators can use the excavator buckets to crush the trees and bury them into the peat mass as part of a ground-smoothing process. The second technique is conventional hand clearance using brush-cutters or chainsaws on low density areas. This requires the contractor to ensure that the tree is cut below the lowest whorl of branches to ensure that no side branches remain or regrow.

6.6 Unit E: Infrastructure restoration

SPR will reuse as much of the existing infrastructure as possible for the repowering project, and any tracks or turbine pads that will not be reused will be decommissioned. The roads and turbines leading up to T8 and T9 are located within areas where habitat management works will be undertaken to improve the bog condition and quality, and it is proposed that the infrastructure will be decommissioned and restored to functioning bog habitat in tandem (Photo 14). This will include the removal of at the top 100-150cm of material (to be used in the repowering infrastructure), and in-filling the void with peat.

Approximately 6, 600m^3 of material will be removed from turbines 8 and 9 and the spur roads leading up to them, based on an excavation depth of 1m, with material to be used elsewhere on the repowering site. Based on the peat depths present at the new infrastructure, approximately 44, 240m^3 of peat soils will be excavated from the repowering infrastructure. This will generate enough

material for use in infrastructure reinstatement; however peat may be required for other areas of reinstatement so additional material may be sourced from old peat banks in Unit C if required.

Photo 14: Road and turbine to be reinstated to blanket bog habitat.

6.7 Unit F: Drain damming

There are a number of drains within Unit F that SPR propose to treat using the wave-damming technique. The rewetting of the area will increase its suitability to waders (including snipe) and improve foraging habitat for various bird species (including skylark and meadow pipit). In addition, approximately 300m quality hedgerow will be planted along Terrydoo Road to compensate for that lost during construction of the main access track.

6.8 Unit G: Ornithological improvement measures

Although it is expected that all the habitat management works described previously will benefit various birds through the creation of foraging and nesting habitat, two adjacent areas of approximately 24ha to the south west of the site will be improved, with a range of management measures targeted to benefit snipe, hen harrier, kestrel, meadow pipit and skylark. A number of wader scrapes will be created within the areas (1-2 per ha) as per best practice guidance (RSPB (2005) Wet grassland practical manual: breeding waders). As identified in the guidance the minimum surface area of a scrape will be 4 m^2; with an irregular shape; with a gently sloping edge with a rough uneven base to a maximum depth of 40 - 70 cm at the centre. There will be no spoil banked around the perimeter of the scrape, and scrapes will not be fenced off to prevent overgrowth by plants. The scrapes will support a variety of invertebrates and become important feeding areas.

Approximately 1.1 km hedgerow and tree planting will be carried out along existing linear features, including riparian tree planting along the Aghadowey River. Exact species and locations will be

confirmed following a more detailed site survey; indicative locations are shown on Map 2. This will create quality foraging habitat for bird species such as hen harrier, which are known to forage along hedgerows and other linear features (Madders, 2003[2]).

In addition, two nest boxes will be installed in the south west of the site: indicative locations are shown on Map 2. The intention of this is to provide nesting locations for kestrel away from the commercial forestry plantation and main windfarm area.

7 Monitoring Proposals

SPR has developed a protocol to monitor vegetation in relation to the objectives set out within this Habitat Management Plan based on extensive experience monitoring similar habitats across Scotland.

Monitoring will be undertaken on a set of n=30 permanent 1m radial samples in Units A, B, C and F (n=90 total). Unit D will only be monitored through a walkover survey as the only management prescription is to remove regenerating conifers. Units E and G will be monitored using fixed point photography only.

At each 1m radial sample the following information is collected for species relevant to the Objectives (target species):

1. Presence/absence of target species
2. By eye cover targets of key metrics (see 2a below)
3. Height and offtake of *Calluna*
4. Depth to water table (using fixed dipwell)
5. 3 pin hits of foliar and basal vegetation cover equally spaced along a 20m transect (long format only)

There are two monitoring methods used: a long monitoring protocol and short monitoring protocol. The short monitoring protocol only records items 1, 2, 3 and 4. The protocols will be applied according to the programme below.

Year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Method	Long	Short	Long	Short	Long		Short		Long

Field protocol

1. Frequency Assessment

At each monitoring sample plot a rope demarcated at 0.25m, 0.50m and 1m will be used to form a radial quadrat. Starting with the smallest distance and working up to 1m, the presence of each target species is to be recorded, noting the smallest distance found. This nested unit size allows different sizes of sampling units to be applied to species of differing abundances for trend monitoring i.e. common species are assessed in smaller units, rarer species are assessed in larger units.

[2] Madders, M. 2003. Hen Harrier Circus cyaneus foraging activity in relation to habitat and prey. Bird Study. Vol 50: 55-60

2. General Cover Assessment
   a) Record each by eye cover assessment within each frequency point (1m circle):
      i) is sphagnum cover > 30% (if unsure record lower)
      ii) is bare peat cover < 1% (if unsure record higher)
      iii) is true grass cover (excluding Molinia) < 5% (if unsure record higher)
      iv) is the combined cover of Calluna, Eriophorum and Tricophorum < 75% (if unsure record higher)

3. Calluna height and offtake

Record the height of a representative *Calluna* plant within each 1m radial plot. Record *Calluna* height from top of the basal layer the depth of the basal layer to peat surface separately. Record the percentage of *Calluna* long shoots browsed.

4. Dipwell protocol

Permanent dipwells will be installed at each monitoring sample plot. During a drought period where there has been no limited rainfall in the preceding 14 days (typically between April and June, although can occur at other times), the dipwells will be measured by measuring from the top of the dipwell to the water table (termed "water depth"), and from the top of the dipwell to the main peat mass surface (termed "peat offset"). By subtracting the peat offset from the water depth it is possible to calculate the true value of the water table within the bog. On a quality bog the water table should remain within 20cm of the surface of the peat mass throughout the year.

5. Pin hits

At each monitoring sample plot a rope demarcated at 1m, 11m and 19m is set out to the west. At each marker point a laser pointer is stood on the north side of the rope and used to record any living plant species, litter or bare peat that it hits directly below. Both basal layer and higher vegetation are to be recorded.

Appendix A: Bog hydrology

Dipwell measurements

Dipwells were installed on a grid across the site at 90m spacing (n=29). Measurements were taken during a drought period (defined as no significant rain in the preceding 2 weeks) to capture a period of stress when the bog water table is drawn down. On unmodified bog, monitoring has shown that the water table level remains within 10cm of the surface (or even less) during drought periods. This is considered to be critical for creating the conditions for specialist bog species such as *Sphagnum papillosum* to survive, and for maintaining the largely anoxic conditions within the catotelm which preserves plant remains as peat (i.e. "active" bog conditions).

The results showed that water table levels across the site were generally poor during drought conditions, with only one out of 29 dipwells achieving the criteria of having a water table within 100mm of the surface (78mm). A further 8 points had a water table 100-200mm below the surface, and the remaining 20 points were over 200mm from the surface. Map 3 shows the spatial distribution of dipwells and the recorded water table depths (0 = water table was not within 100/200mm of the surface, 1 = water table was within 100/200mm of the surface).

No dipwells within Units A and B achieved a water table level within 200mm of the surface, supporting the conclusion that the site is degraded from a functional bog perspective. A small number of dipwells in Units C and D achieved a water table level within 200mm of the surface, and only one dipwell reached within 100mm of the surface. The site would therefore benefit from interventions to restore the underlying hydrology.

Appendix B: Wave damming summary

The process

1. Identify the drain. The excavator has tracked down the drain, flattening the vegetation and exposing the oxidised peat slope either side of the cut channel. The excavator will straddle the drain, facing upslope. The operator will begin working at the top of the slope, building the dams as they move downhill.

2. The operator will start work on one side of the dam, on the oxidised peat slope. The operator uses the bucket to cut into the peat mass circa. 800mm depth. The bucket is then used to pull the peat towards the excavator, thrusting material upwards. Care should be taken to ensure that the operator does not flip the peat during this process, and the vegetated surface remains on top.

3. Using the back of the bucket, the operator pushes the back of cut peat towards the machine so that it is compressed into place with a ramped face.

4. The operator will repeat this action a second time, in the middle of the drain.

5. The operator will then repeat this action a third time on the other side of the drain, on the oxidised peat slope. The dam is now three bucket widths wide, although additional width can be achieved using additional bucket widths.

6. The operator then uses the bucket to flatten and compress the top of the dam.

7. The operator then uses the bucket to flatten the edge of the cut face behind the dam. This will enable any livestock a way to climb out of the dam.

8. The finished process.

About wave damming

Timing

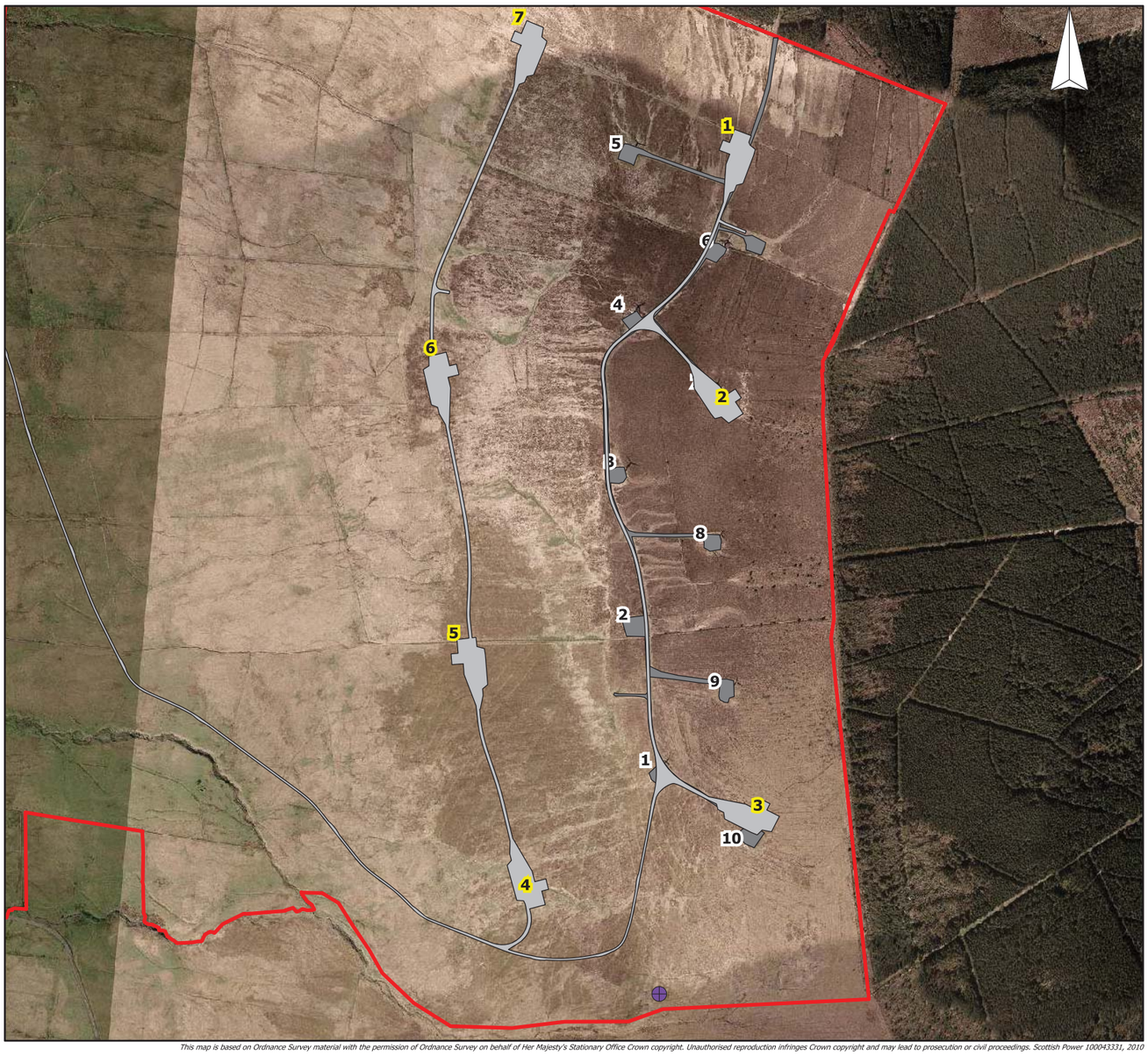
The time taken to build a wave dam is on average about 1minute; significantly faster than traditional dams which take over ten minutes to build.

Spacing

The wave dams are installed close together, roughly every 3-4m. This spacing was specified so that there was not more than a 10cm drop in ground level between each dam location so that water stored behind the dam can re-wet the intermediate drain space and adjacent ground. The spacing of dams is also dependent on local gradient.

Width

The width of the dam ensures that not only the ditch itself is blocked, but also the collapsed oxidised slopes on either side of the channel. This reduces the likelihood of a new hydrological flow around the side of the dam, and encourages the water to spread out and rewet the wider bog.



SCOTTISHPOWER RENEWABLES

Legend

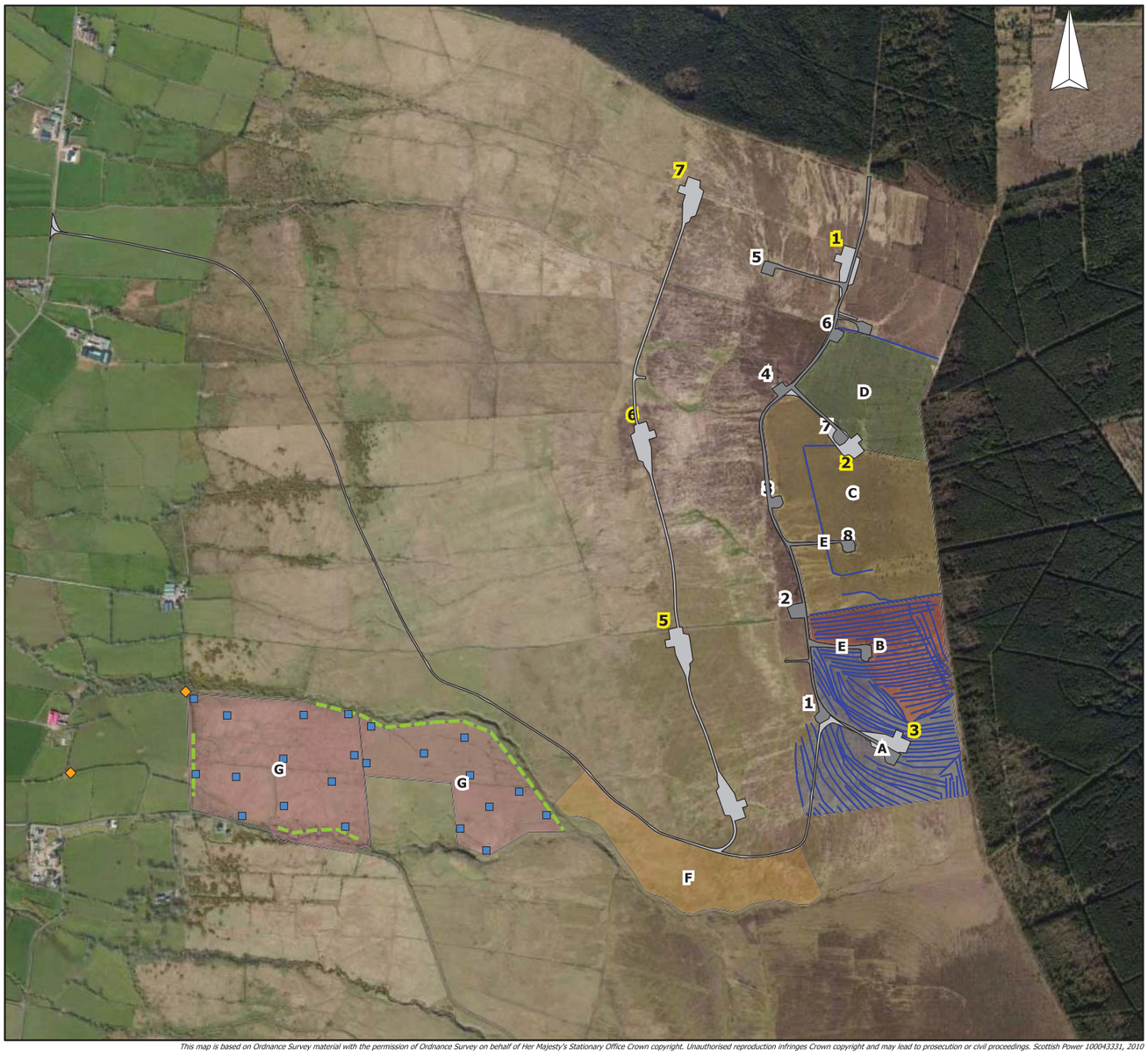
- Site boundary
- Existing infrastructure
- text — Existing turbines
- Repowering infrastructure
- text — Repowering turbines
- Permanent met mast

Scale: 1:9700 @ A4

Status	Date	Dr.	Ch.	Apl
FINAL	Jul 2019	SR	PR	PR

Site layout

Rigged Hill repowering Version 3.0	Map 1



SCOTTISHPOWER RENEWABLES

Legend

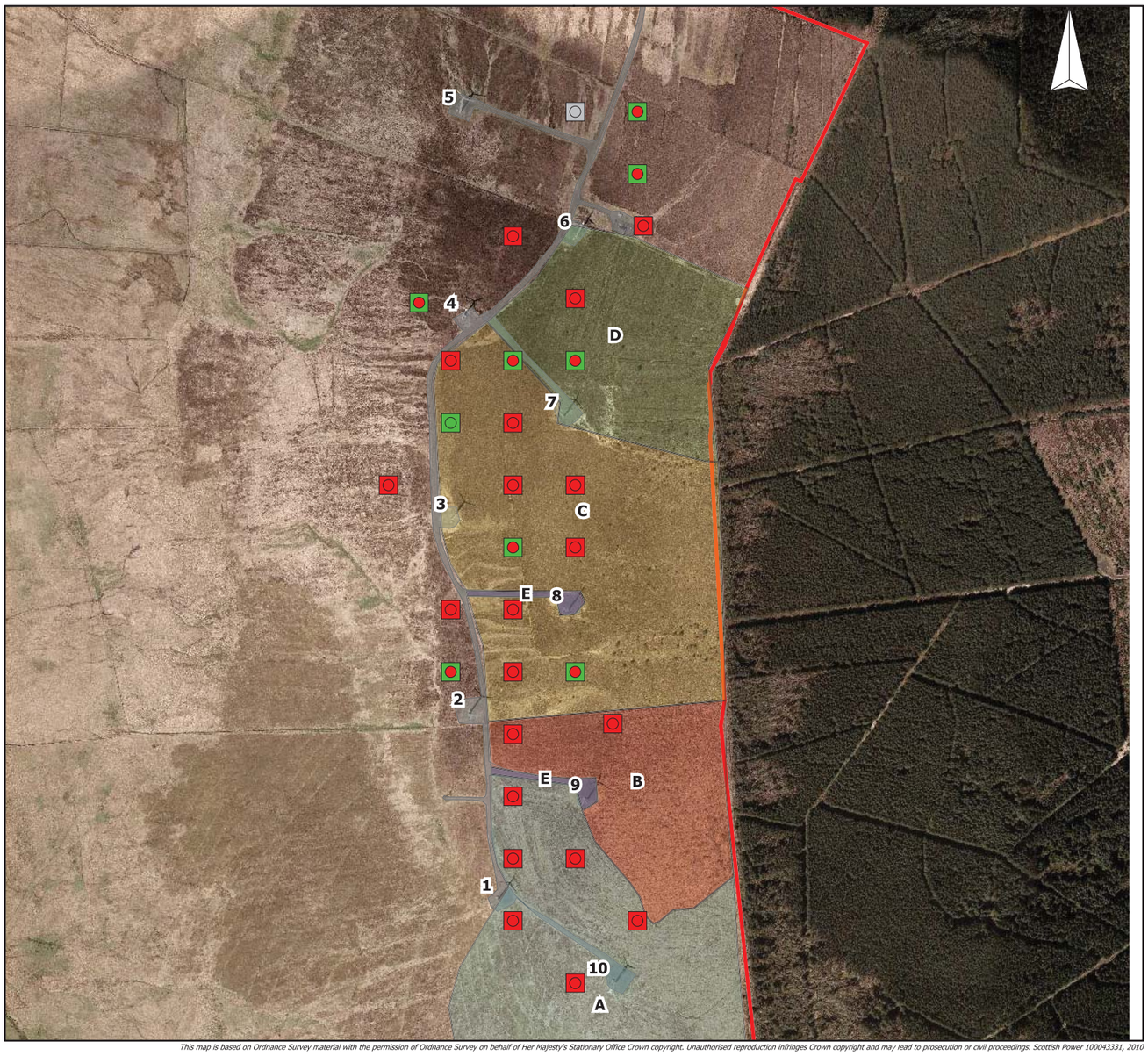
- Existing infrastructure
- text — Existing turbines
- Repowering infrastructure
- text — Repowering turbines
- Management units
- A
- B
- C
- D
- E
- F
- G
- Drains
- Enhancement measure
- Kestrel nest box
- Wader scrape
- HH hedges/ trees

Scale: 1:23000 @ A4

Status	Date	Dr.	Ch.	Apl
FINAL	Jul 2019	SR	PR	PR

Management measures

Rigged Hill repowering Version 3.0	Map 2



SCOTTISHPOWER RENEWABLES

Legend

- Site boundary
- Existing infrastructure
- text
- Existing turbines
- Management units
- A
- B
- C
- D
- E
- Dipwell within 100mm of surface
- 0
- 1
- Dipwell within 200mm of surface
- 0
- 1

Scale: 1:7600 @ A4

Status	Date	Dr.	Ch.	Apr
FINAL	Jul 2019	SR	PR	PR

Hydrology

Rigged Hill repowering
Version 3.0

Map 3